

# PROF. NORDENSKJÖLD ON THE JENISEI

IN a letter from Prof. Nordenskjöld, of Stockholm, to Mr. Oscar Dickson, Prof. Nordenskjöld gives the following further details of his expedition.

In my preceding letters I narrated the progress of the Novaya Zemlya Jenisei Expedition up to the time when we, after a boat voyage of fifty to sixty Swedish miles, at Saostrowskoj on Aug. 31, fell in with the steamer *Alexander*, in which we afterwards journeyed 150 Swedish miles further up the Jenisei during a whole month to the town of Jeniseisk.

I proceed now to finish the account of my journey, with a short sketch of this steam voyage.

The *Alexander* was neither a passenger nor a cargo steamer, but formed a moveable warehouse propelled by steam, which was commanded not by seamen but by a friendly and affable merchant, who clearly did not much concern himself with the navigation of the vessel, but rather with trade and goods, and was seldom by the crew called "captain" but generally "hosain" (master). The arrangement of the vessel itself corresponded to this state of things. The whole of the fore-saloon was fitted up as a shop with shelves for goods along the walls, the usual desk, &c. The after-saloon was employed as a counting-house, writing and sleeping apartment for the master, and was besides filled to overflowing with wares of various kinds for sale, spirit casks, &c. There was thus no room for passengers, and at the first when we lay-to with the Swedish flag hoisted, our "hosain," Herr Ivan Michailovitch Jarmenief's reception of us was by no means specially friendly. He was even indisposed in the beginning to take us along with him. But no sooner had I, with the help of our pilot Teodor and a Swedish-Russian lexicon, succeeded in explaining to him what sort of people we were and what journey we had made, than all was completely changed, and from that moment we had in our "hosain" the most agreeable and obliging host we could desire. In order to make room for us on board, a cabin before the wheel-house, which had been filled with goods, was emptied and arranged for passengers. Its size was by no means great. During the night, for instance, we could only with difficulty lie alongside each other on a bedstead formed of boards, which took up nearly the whole cabin. Our men at first got places wherever they could, in the engine-room, where they were kindly entertained by the engineer. Afterwards we obtained another more roomy cabin, and our men got that which we had in the beginning.

The navigation of the vessel was managed by two mates, of a stately and original appearance, who, clothed in long caftans, each during his watch sat on a chair at the wheel, generally without steering, for the most part smoking a "papiross," and with the most unconcerned expression in the world exchanging jokes with those who were walking below. A man stood constantly in the fore part of the vessel, unceasingly trying the depth of the water with a long pole. In order to avoid the strong current of the deep central stream the course was taken not in the deepest part of the river, but as near the bank as possible, often so near that we could almost jump to land, and that our Nordland boat, which was towed alongside the steamer, was often drawn over land. The *Alexander* besides had in tow first one, afterwards two vessels (lodjor), nearly of the same size as the steamer itself, intended to receive the fish bought during the voyage, which was generally salted and prepared on board. The whole way between Jeniseisk and the sea there is not a single jetty, and on this account both the steamer and the two lodjor towed in addition a number of larger or smaller barges and boats intended for communication with the land. Siberia,\* and especially the river territory of Jenisei, possesses rich coal beds, which probably extend under a great part of the Siberian plain, but as yet are not worked, and attract little attention. Like all the other steamers on the Siberian rivers, accordingly the *Alexander* was fired not with coal but with wood of which 180 fathoms, if I remember rightly, went to the voyage up the river. The steamer could carry only a small portion of this quantity, on which account frequent delays were necessary, not only for trading with the inhabitants, but also for taking fuel on board. The feeble engine, besides, notwithstanding that the safety valves were in case of need overloaded with lead weights,

was often enough unable to make head with all it had in tow against the current, which at some places was very powerful, and in the attempt to find stream-free water near the banks, the vessel often went too near land and ran aground, notwithstanding the continual "ladno" cry of the pilot with the pole posted in the forepart of the steamer. We went, therefore, so slowly, that it was only after the lapse of a whole month that we reached the destination of the steamer, the town Jeniseisk, situated about 150 Swedish miles from Dudino.

In such circumstances most passengers by a steamer would be impatient and in bad humour. To us, on the contrary, the delay was welcome; inasmuch as we had thus an opportunity of extending our examination of the flora and fauna of the territory of the Jenisei even beyond the 60th degree of latitude. It is easy to see that a portion of these researches will also have a practical interest; for instance, the examination which Dr. Lundström has made of the flora of North Jenisei.

Our knowledge of it has heretofore been grounded chiefly on observations made by men of science (Middendorff, Schmitt, &c.) who have visited these regions for other purposes, and only in passing have had opportunities of turning attention to the flora. Dr. Lundström's main object, on the contrary, was exclusively botanical (he had before made himself well acquainted with the Arctic plant world by botanical journeys in Lapland and his native Nordland), and as he came during the voyage up the river from the northerly regions, poor in species, to the southerly, richer in species, it was easier for him than for one who travelled in an opposite direction to give the northern limit of a number of species of general occurrence common to Siberia and Scandinavia. Abundance of botanical and climatological material has been collected in this way, which naturally is not yet worked up, but it is easy to see what new light a comparison of the spreading of plants towards the north in our long-cultivated land and the desolate plains of Siberia will shed on the possibility of cultivating the latter country. Already I may be permitted here to mention that in opposition to what would have appeared probable beforehand the northern limit of many plants in Siberia is situated farther towards the north than in Sweden. To a certain extent this may perhaps depend on the seed being carried by the great river from more southerly southerly regions, but it also appears that the severe winter of Siberia has by no means any specially injurious influence on the vegetation of the summer.

Immediately after we came on board the steamer weighed anchor and steamed to the church village, Dudino, situated some miles up the river, where its tributary, the Dudinka, falls into it. The village consists of some few houses inhabited by an influential merchant, Sotnikoff, two priests, a "smotritel" (magistrate), a pair of exiles, and some workmen and natives. Sotnikoff carries on an extensive and profitable trade with the natives in the whole of the surrounding district, exchanging grain, cloth, tea, sugar, iron wares, gunpowder, lead, brandy, &c., for furs, fish, mammoth-teeth, &c., which last he sends with the steamer, first up the Jenisei, and afterwards by different methods of communication on to China, Moscow, Petersburg, &c. In his account of his well-known expedition for disinterring a mammoth found near the mouth of the Jenisei, the Petersburg academician Schmitt praises Sotnikoff much for the unselfish and energetic way in which the expedition was assisted by him. To us too was this plain unpretentious merchant specially hospitable and friendly, and it is incumbent on me to mention that we also met with the same reception from all the other notabilities of the place. The friendly clergyman, who was much interested in our journey, even performed a short thanksgiving service for the successful issue of the expedition on board the steamer and declined to accept any special honorarium on this account.

As in the more northerly situated "simovies," the houses in all the villages situated on the Jenisei were built of logs in much the same style as those of the well-to-do peasants in Russia, pretty close together, with richly decorated gables to the street or road of the village. The interior of the houses was, if we except the innumerable cockroaches found everywhere, very clean, and the walls were adorned with numerous, if not very artistically finished photographs and engravings for the most part of the Russian imperial family, remarkable Russian notabilities, generally in general's uniform, scenes from Russian history, &c. Richly ornamented consecrated pictures were always placed in a corner, and before these were always suspended some oil lamps or small wax lights, which were lighted on holydays. Sometimes the floor, at least in the principal room, was besides covered with

\* As an instance, may be mentioned some exceedingly rich coal seams, which crop out on the eastern bank of the Jenisei, a little to the south of the town Krasnojarsk, just in the neighbourhood of the place where the "Pacific Railway" of Siberia will probably some day go forward. When I visited the place one of the coal seams was on fire. Nearer the mouth of the Jenisei, too, coal seams of considerable extent occur, for instance, at the bank of a tributary of the Jenisei, not far from Dudino.

mats of furs. The bed consisted of a couch near the roof, so extensive that it occupied a third or a half of the room, and so far from the floor that a man could go under it upright. Food was prepared in large baking ovens, which were daily fired for this purpose, and warmed the hut at the same time. New bread was to be had every day; and even for the poor a large brass tea urn was a necessary household article. We were always sure of meeting with a hearty and friendly reception wherever we stepped over the threshold, and if we stayed a short time we had generally to drink a glass of tea with our hosts whatever time of the day it might be. The dress everywhere somewhat resembled the common Russian; for the better classes for instance wide velvet trousers stuck into the boots, a shirt grandly embroidered with silver, and a wide caftan often trimmed with fur; for the poor, in case he was not too ragged, the same cut, but inferior, dirty, and torn material. During the winter, however, the Samoyede fur dress is worn out of doors both by high and low, by Russian and native, by settled and nomad.

For the present there were in these regions only very few persons who had been banished hither for political reasons, but on the contrary many exiled criminals, and among them also some few Finns, and even a Swede, or at least one who according to his own statement in broken Swedish had formerly served in the King's body-guard in Stockholm. Security for person and property was in all cases complete, and it was remarkable that there was no true difference of caste that could be observed between the Russian-Siberian natives and those who had been banished to those regions for crimes. Little interest even appeared to be taken in knowing the crimes which had caused the banishment. An inquiry on this point was generally met by the sufficiently elastic reply "for bad conduct."

I mentioned above that mammoth teeth here form an important article of commerce. They are also believed to occur in large quantity on the tundra, though the difficulty of communications often renders their removal impossible. Although this is the mammoth region proper, the larger parts of the skeleton are believed to be very rare, and still more mammoth with flesh, hide and hair still remaining. It was, for instance, on the peninsula between Obi and Jenisei, that the great mammoth find by Trofimoff occurred, and in the neighbourhood of the same place was found the mammoth which gave occasion to Schmitt's expedition. It is probable, besides, that the nomad native has the same indisposition to acquaint an official with a large mammoth find as the peasants at home had in former times, and in certain regions still have to give information about a supposed vein of ore.

On Sept. 4 the *Alexander* weighed anchor, and steamed southwards during splendid weather.

The landscape now began by degrees to change its character completely. In fact, on most maps the limit of wood is drawn along the considerable bend which the river Jenisei makes immediately west or north-west of Dudino, and indeed here for the first time numerous pine trees are met with, but seldom more than 20 feet high. These cover the heights with a sparse and by no means attractive vegetation, completely destitute of the beautiful effect which distinguishes the willow and alder bushes farther north. Already some few miles south of Dudino, however, the pine forest became tall, though here we are still north of the Arctic circle. It is here that the forest proper commences—the largest forest of the globe—stretching with little interruption across the whole of Siberia, in one direction, from Ural to the Sea of Ochotsk, and in the other, south of the 58th or 59th degree of latitude, and north of the Arctic circle, at some places, for instance at the rivers Chatanga and Lena, beyond it on to the neighbourhood of 72° N. lat., that is to say, to the mouths of Chatanga and Lena, ten Swedish miles north of North Cape.

During our boat and steam voyage up the Jenisei we had heretofore only landed either upon the eastern bank of the river, which was always high, or on some of the numerous islands which at some places occur in the river, which widens out nearly to a lake. On Sept. 7 we had, for the first time, an opportunity of landing on the western bank of the river, which, like the western bank of most of the rivers flowing from the south to the north, consists of low tracts of land which are inundated in spring. This meadow land was now covered partly with an extraordinarily luxuriant carpet of grass, which of course was untouched by the scythe, partly with an exceedingly peculiar bush vegetation of equal height, in which we found a number of herbs known among us in Sweden, but here six to eight feet high. Compact thickets of a beautiful straight-stemmed willow frequently alternated with even grass turf of a lively green with

small streams, tributaries of the Jenisei, in a way which gave the impression of the most beautiful park, carefully kept and watered, and kept clear of withered branches and grass. On the eastern side, on the contrary, the ancient forest proper commenced close to the river bank. Here nature had quite a different stamp of grandeur and gloom. The forest consisted principally of pines, which, even north of the Arctic Circle, were often of the most colossal dimensions, but in such cases many times grey and shortened to half their height by age. Between these the ground was so covered with fallen stems, with branches nearly fresh, half decayed or converted into a mass of wood mould, which was kept together merely by the bark, that one could force his way only with difficulty and with danger of breaking his legs in the thicket. The fallen stems were besides completely covered, many times even concealed by an uncommonly luxuriant moss vegetation; the tree lichens, on the contrary, occur here only sparingly, in consequence of which the spruce firs were devoid of the shaggy clothing common with us, and the bark on the birches which glanced out here and there among the spruce firs was distinguished by an uncommonly blinding whiteness. When one made his way into this monotonous wood a little distance from the river, it was necessary to be well acquainted with the points of the compass; a mistake in this respect had carried us in a direction in which at a distance of a hundred, perhaps two hundred (Swedish), miles, there was no probability of meeting with an inhabited place. In speaking of the vegetation in these regions it may be mentioned that in the northern forest along the river bank there was abundance of wild red and black currants exceedingly well tasted, and of dimensions surpassing even the largest varieties of cultivated currants I have had an opportunity of seeing.

Since we left Jewremow-Kamen, near the mouth of the Jenisei, we had not seen any solid rock at the river banks, but on the 8th we saw solid rocks on the eastern bank. We made here, as at a number of the other places at which we landed, a rich collection of land molluscs. By means of these collections, which have been already handed over to our skilful molluscologist, Dr. C. A. Westerlund, at Ronneby, to be examined, the known mollusc-fauna of North Siberia will be greatly increased, and many erroneous views hitherto prevalent regarding the geographical distribution of this interesting group of animals will be rectified. This holds good also of various land and freshwater invertebrates, of which considerable collections were made, which have already been distributed to specialists for examination.

After having remained for a longer or shorter time at about ten different "simovies" or fishing-stations, we came on Sept. 12 to a "simovie," Silivauskoi, exclusively inhabited by Skoptists. The orthodox Russian Church is, as is well known, tolerant towards men of foreign faiths, Lutherans, Catholics, Jews, Mohammedans, Buddhists, &c., but, on the contrary, in full accordance with what took place in former times within the Protestant world, visits sectaries within its own bosom with temporal punishments in this world and threatens them with eternal in another. Especially in former times have a number of sectaries been sent to Siberia, and there are accordingly peculiar colonies in a very prosperous state to be met with occasionally, exclusively inhabited by a certain sect. Such is the Skopt colony at Silivauskoi, of which it may be remarked that the nature of the religious delusion here excuses the stringency of the law or the administration. For, on the ground of a text in the Gospel of Matthew, interpreted in a peculiar way, all Skoptists subject themselves to a self-mutilation, in consequence of which the sect can exist only through new proselytes, and remarkably enough, these madmen, in fact, notwithstanding, or perhaps just on account of, all persecution, still find successors. A number of Skoptists are Ingrians (Finns from Ingermanland), on which account I could converse with them without difficulty. They related that they had "for righteousness' sake" been torn from their homes, imprisoned, flogged, and sent to Siberia. Here they had by industry and perseverance succeeded in attaining for themselves a certain competence, were hospitable and friendly, and bore with resignation their hard lot, assured that in another life they would reap a rich reward for their self-denial, suffering, and misfortunes here below. They did not kill any warm-blooded animal, "for it was a sin to kill what the Lord had created," which did not prevent them from catching and eating fish, nor from selling to us, who in any case were doomed to perdition, for 18 roubles a beautiful and fat ox, on condition that our own people should slaughter it. Their indisposition to use some animal foods had besides had the good result that their



attention was turned to the cultivation of the soil. Round the huts, accordingly, were patches of land in potatoes, turnips, and cabbage, which at least this year yielded abundant crops, though the colony is situated in the latitude of Avaxaxa, that is to say, under the Arctic circle.

Later in the day we came to the Monastery of Troit, in former times renowned and rich, now inhabited only by a single monk, viz., the prior himself. He was a worthy old man, who gave us a hospitable and friendly reception. The apartment for the reception of guests was adorned with a number of portraits of Siberian bishops. There was besides a portrait of a Russian Czar in powdered hair and military uniform, with blue great cross riband. It was a portrait of Czar Paul, but through some exchange the Skoptists had taken it into their heads that the portrait represented their holy prophet, Czar Peter III., whose history they had completely altered in accordance with their idealised conception of the world. An educated man, who belonged to this sect, and on this account had been banished to North Jenisei, informed me accordingly in all seriousness that Czar Peter III. was not murdered, but was knouted and sent to Siberia, &c., all on account of his holiness—as so it happens now that in consequence of all this the portrait of Czar Paul in the Troit Monastery is a sacred picture to which worship is offered.

A. E. NORDENSKJÖLD

(To be continued.)

### SCIENTIFIC SERIALS

THE *Journal of the Chemical Society* for December 1875 contains the following papers communicated to the Society:—On the agricultural chemistry of the tea-plantations of India, by J. Campbell-Brown, D.Sc. This lengthy paper contains analyses of the young and old leaves of good plants and of stunted and blighted plants of different varieties, analyses of the wood of good and stunted tea-plants of different varieties, analyses of tea-seed, of the soils of tea-plantations, and of tea from manured and unmanured plants. The author discusses also the analytical results.—On certain new reactions of tungsten, by Prof. J. W. Mallett, of the University of Virginia. The author has found, contrary to the statements in text-books, that the precipitate produced by hydrochloric acid in a solution of an alkaline tungstate is soluble in an excess of the concentrated acid. By adding fragments of metallic zinc to the above-named acid solution, various colours are produced, the most noteworthy being a brilliant magenta. Potassium sulphocyanate and metallic zinc added to the acid solution produce a rich green colour, but when the sulphocyanate is added first to the alkaline tungstate solution, then a considerable quantity of water, then hydrochloric acid, and finally zinc, a fine amethyst colour is produced. The blue colour well known as characteristic of one of the lower oxides of tungsten may be best brought out by the use of hyposulphurous acid ( $\text{H}_2\text{SO}_3$ ) as the reducing agent.—The remainder of the journal contains the usual collection of abstracts.

*American Journal of Science and Arts*, Dec. 1875.—This number commences with a paper of careful observations by Prof. Dana on five of the river valleys of Southern New England, with a view to ascertaining the depression of that region during the melting of the glacier. This he estimates at about 15 feet. He considers that the terraces in the Housatonic, Connecticut, and Thames, which are now so high above the river's surface, were not wholly, or mostly formed when the land was at a much lower level than now, but they were formed when the rivers were at a greatly higher level than now, owing chiefly to the glacial flood. Thus we may have high and numerous terraces along valleys, and yet none be due to an elevation of the land. The height of the streams during the flood above high tide level is estimated in one case at as much as 237 feet (from which the 15 feet depression would be deducted). The amount of depression increased from the sound northwards at about one foot and a half per mile, since Dawson has shown that the height of the beaches at Montreal indicate a depression there of 500 feet. The waters from the melting glacier must have brought down the streams in vast volume to have piled to so great heights before outlets so wide and deep.—Prof. Storer, of Harvard, gives some observations which show (after Schönbein) that ammonia is a constant contaminant of sulphuric acid, and further, that it is a more frequent impurity in chemical substances (prepared with aid of sulphuric acid) than has been supposed.—An abstract is given of a memoir by Prof. Suess of Vienna on the origin of the

Alps.—Mr. Andrews describes some new and interesting coal-plants from Perry County, Ohio, and Dr. Becker calls attention to a new feature in the "Comstock Lode" in Nevada.—In a letter from Dr. Gould, of Cordoba Observatory, the writer states that his zone observations, begun in 1872, are now completed; and the entire region from  $23^\circ$  to  $80^\circ$  of south declination has been carefully scrutinised. The  $10^\circ$  round the pole have been examined by Gillis at Santiago and Stone at Cape of Good Hope, and Gould's northern limit overlaps Argeländer's southern zone by eight degrees (as Argeländer had requested).

Supplementary December Number.—Mr. Langley here contributes a paper on the solar atmosphere, being introductory to an account of researches made at the Alleghany Observatory. The estimates of the absorptive power of this atmosphere, based on photometric comparison of the centre and edge of the sun, have been widely discrepant; thus Arago thought the light of the centre must be diminished  $2\frac{1}{4}$  per cent. to equal that of the edge; Liais's estimate is 10 and Secchi's 78 per cent. Mr. Langley here describes a new method of measurement free from some of the objections to previous ones; and he thinks the estimates of Secchi (who used La Place's formula) are certainly in excess of the truth. Not much more or less than one half (he considers) of the whole so-called "luminous heat rays" are absorbed, turned back, or converted into work, in the sun's atmosphere. The total thermal absorption is somewhat less. The method is also applicable to sun-spots, &c., and Mr. Langley finds the absolute light of the "nuclei" in spots at least five thousand times that of the full moon.—In a supplemental paper on Southern New England during the melting of the great glacier, Prof. Dana discusses the overflows of the flooded Connecticut, which he concludes was at that time a great stream 150 feet deep and fifteen miles wide.

### SOCIETIES AND ACADEMIES

LONDON

Royal Society, Jan 6.—On the length of the Spark from a Battery of 600, 1,200, 1,800, and 2,400 rod-Chloride of Silver, and some Phenomena attending the Discharge of 5,640 Cells, By Warren De La Rue, D.C.L., F.R.S., and Hugo W. Muller, F.R.S.

On the 24th February, 1875,\* we had the honour of communicating to the Society, in conjunction with our friend Mr. Spottiswoode, an account of some experiments to ascertain the cause of stratification in electrical discharges *in vacuo*. These experiments were made with a battery of 1,080 cells of powder-chloride of silver, which was described; we have now in action 3,240 such cells, and have recently completed 2,400 rod-chloride of silver cells,† making our total force 5,640 cells in action. To these will be shortly added another unit of 1,080 cells powder-chloride, and two other units of 1,200 rod-chloride, making a total of 9,120 cells.

We have more recently made a verbal communication to the Society of Telegraph Engineers, and also in October last a written one to the Académie des Sciences of Paris‡, wherein we have stated that the length of the spark in air appears to be in the direct ratio of the square of the number of cells.

Having completed the 2,400 cells, and charged them up in a single day, they were exactly in the same condition as to electromotive force and internal resistance, consequently they afforded the means of testing the truth of the law of the length of spark in a manner more efficacious than had hitherto obtained, the more especially as by the use of paraffin corks and other precautions we had obtained an excellent insulation.

Our assistant, Mr. Fram, has constructed a discharger which permits of the accurate measurement of the distance of the terminals to read to  $\frac{1}{1000}$  of an inch, and by estimation to the tenth of that quantity. The nut, through which the screw ( $\frac{1}{16}$  of an inch), carrying one of the terminals, works, is divided into two parts, which are separated by a spiral pressure-spring, so as to prevent shake. In making measurements the terminals are separated to a greater quantity than the anticipated striking-distance, and gradually approached until the spark passes; the discharger is then detached from the battery, and after reading the scale, connected up with a separate battery of 10 cells, with a detector-galvanometer in circuit. The terminals are again approached until the motion of the galvanometer indicates contact between

\* Proc. Roy. Soc., No. 160, 1875.

† Proc. Roy. Soc., No. 160, 1875, p. 357.

‡ "Comptus Rendus," No. 16, p. 686; No. 17, p. 746, 1875.